

## WHAT IS CLAIMED IS:

1           1. A system for computing optical flow between  
2       images within an image sequence comprising:

3                   an image processor processing the image sequence,  
4       wherein the image processor:

5                   derives epipolar geometry for the images  
6       from point matches between the images; and  
7                   computes optical flow for each pixel within  
8       at least one of the images under a constraint derived  
9       from the epipolar geometry.

1           2. The system according to claim 1, wherein the  
2       image processor, in deriving the epipolar geometry for the  
3       images, computes sparse optical flow between the images.

1           3. The system according to claim 1, wherein the  
2       image processor, in computing optical flow for each pixel  
3       within at least one of the images, employs a constraint  
4       derived from a fundamental matrix between the images.

1           4. The system according to claim 1, wherein the  
2       image processor utilizes the constraint derived from the  
3       epipolar geometry in combination with least squares  
4       minimization to compute optical flow for each pixel within  
5       at least one of the images.

1           5. The system according to claim 1, wherein the  
2       image processor utilizes the constraint derived from the  
3       epipolar geometry in combination with robust statistical  
4       methods to compute optical flow for each pixel within at  
5       least one of the images.

1           6. The system according to claim 1, wherein the  
2       image processor computes optical flow  $u, v$  for each pixel  
3       within at least one of the images from  $I_x u + I_y v + I_t = 0$ , where  
4        $I_x$ ,  $I_y$ , and  $I_t$  are known spatio-temporal derivatives of  
5       image intensity at each pixel within the at least one  
6       image, and  $a_{x,y}u + b_{x,y}v + c_{x,y} = 0$ , where  $a_{x,y}$ ,  $b_{x,y}$  and  $c_{x,y}$  are  
7       derived from a fundamental matrix  $F$  between the images.

1           7. The system according to claim 1, wherein the  
2       image processor computes dense optical flow between the  
3       images.

1           8. A system for computing optical flow between  
2        images within an image sequence comprising:

3                 a video receiver including an input for receiving  
4        the image sequence;

5                 an image processor within the video system  
6        processing the image sequence, wherein the image processor:

7                 derives epipolar geometry for the images  
8        from point matches between the images; and

9                 computes optical flow for each pixel within  
10      at least one of the images under a constraint derived  
11      from the epipolar geometry.

2           9. The system according to claim 8, wherein the  
3        image processor, in deriving the epipolar geometry for the  
4        images, computes sparse optical flow between the images.

1           10. The system according to claim 8, wherein the  
2        image processor, in computing optical flow for each pixel  
3        within at least one of the images, employs a constraint  
4        derived from a fundamental matrix between the images.

1           11. The system according to claim 8, wherein the  
2       image processor utilizes the constraint derived from the  
3       epipolar geometry in combination with least squares  
4       minimization to compute optical flow for each pixel within  
5       at least one of the images.

1           12. The system according to claim 8, wherein the  
2       image processor utilizes the constraint derived from the  
3       epipolar geometry in combination with robust statistical  
4       methods to compute optical flow for each pixel within at  
5       least one of the images.

1           13. The system according to claim 8, wherein the  
2       image processor computes optical flow  $u, v$  for each pixel  
3       within at least one of the images from  $I_x u + I_y v + I_t = 0$ , where  
4        $I_x$ ,  $I_y$ , and  $I_t$  are known spatio-temporal derivatives of  
5       image intensity at each pixel within the at least one  
6       image, and  $a_{x,y}u + b_{x,y}v + c_{x,y} = 0$ , where  $a_{x,y}$ ,  $b_{x,y}$  and  $c_{x,y}$  are  
7       derived from a fundamental matrix  $F$  between the images.

1           14. The system according to claim 8, wherein the  
2       image processor computes dense optical flow between the  
3       images.

1           15. A method for computing optical flow between  
2       images within an image sequence comprising:

3                 deriving epipolar geometry for the images from  
4       point matches between the images; and

5                 computing optical flow for each pixel within at  
6       least one of the images under a constraint derived from the  
7       epipolar geometry.

1           16. The method according to claim 15, wherein the  
2       step of deriving the epipolar geometry for the images from  
3       point matches between the images further comprises:

4                 computing sparse optical flow between the images.

1           17. The method according to claim 15, wherein the  
2       step of computing optical flow for each pixel within at  
3       least one of the images under a constraint derived from the  
4       epipolar geometry further comprises:

5                 computing optical flow employing a constraint  
6       derived from a fundamental matrix between the images.

1           18. The method according to claim 15, wherein the  
2       step of computing optical flow for each pixel within at  
3       least one of the images under a constraint derived from the  
4       epipolar geometry further comprises:

5           utilizing the constraint derived from the  
6       epipolar geometry in combination with least squares  
7       minimization to compute optical flow for each pixel within  
8       at least one of the images.

1           19. The method according to claim 15, wherein the  
2       step of computing optical flow for each pixel within at  
3       least one of the images under a constraint derived from the  
4       epipolar geometry further comprises:

5           utilizing the constraint derived from the  
6       epipolar geometry in combination with robust statistical  
7       methods to compute optical flow for each pixel within at  
8       least one of the images.

1           20. The method according to claim 1, wherein the step  
2       of computing optical flow for each pixel within at least  
3       one of the images under a constraint derived from the  
4       epipolar geometry further comprises:

5                   computing optical flow  $u, v$  for each pixel within  
6       at least one of the images from  $I_x u + I_y v + I_t = 0$ , where  $I_x$ ,  $I_y$ ,  
7       and  $I_t$  are known spatio-temporal derivatives of image  
8       intensity at each pixel within the at least one image, and  
9        $a_{x,y}u + b_{x,y}v + c_{x,y} = 0$ , where  $a_{x,y}$ ,  $b_{x,y}$  and  $c_{x,y}$  are derived from a  
10      fundamental matrix  $F$  between the images.